

SUMMARY
BIOLOGICAL OPINION FOR REPAIR AND/OR REPLACEMENT OF
ARAVAIPA CREEK ROAD AND ISSUANCE OF RIGHTS-OF-WAY

Date of the opinion: February 15, 1995

Action agencies: Federal Emergency Management Agency (FEMA) (lead)
Bureau of Land Management (BLM)

Project: FEMA funding for rerouting of Aravaipa Creek road to bypass two areas washed out in flooding of winter 1993 and BLM issuance of rights-of-way for the new road and utility alignments

Location: Pinal County, Arizona

Listed species affected: Spikedace (Meda fulgida) - threatened with critical habitat
Loach minnow (Tiaroga cobitis) - threatened with critical habitat

Biological opinion: Nonjeopardy (page 2)

Incidental take statement: (page 13)

Anticipated take: none

Reasonable and prudent measures: none

Terms and conditions: none

Conservation recommendations: Implementation of conservation recommendations is discretionary. It is recommended that interpretative signs be used during construction to inform public of resource protection achieved through project. (page 14)



UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
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February 15, 1995

In Reply Refer To:
AESO/SE
2-21-94-F-090

Nicholas B. Nikas
Federal Emergency Management Agency
Building 105
Presidio of San Francisco
San Francisco, California 94129

Dear Mr. Nikas:

This responds to your request of September 29, 1994, for formal consultation pursuant to Section 7 of the Endangered Species Act (ESA) of 1973, as amended, on repair and/or replacement of segments of the Aravaipa Creek road in Pinal County, Arizona. The species of concern are the threatened spikedace (Meda fulgida) and the threatened loach minnow (Tiaroga cobitis).

The following biological opinion is based on information provided in the Federal Emergency Management's (FEMA) October 1994 draft Environmental Assessment and its appendices as amended by a November 2, 1994 memorandum (EA), project information provided by FEMA on February 6, 1995, a record of a January 27, 1995 telephone conversation between FEMA and the San Carlos Irrigation Project, several site visits by Fish and Wildlife Service (Service) biologists, a January 31, 1993 meeting with the Aravaipa Property Owners' Association, meetings with FEMA, Bureau of Land Management (BLM), and other concerned parties, data in our files, and other sources of information.

CONSULTATION HISTORY

This consultation was preceded by an emergency section 7 consultation (2-21-93-I-165) with the Corps of Engineers (Corps) for a temporary low-water ford crossing on Aravaipa Creek road to allow private land owners access to the property above the road washout. Operating conditions for the emergency consultation were formalized to the Corps by a Service letter of March 3, 1993. Under the terms of the regulations implementing section 7 of the ESA, the action agency in an emergency consultation must initiate formal consultation as soon as

practicable after the emergency is under control. The Corps has not yet initiated formal consultation on that emergency consultation and no biological opinion has been issued.

In anticipation of final road reconstruction, Pinal County in November 1993 used heavy equipment to place a small earthen diversion dam into Aravaipa Creek at the road washout. The County erroneously believed this work to be covered by the emergency consultation which addressed the temporary low-water crossing; however, the work was unauthorized by ESA or section 404 of the Clean Water Act. The dam was removed by the County on December 4, 1993.

Formal consultation on a reconstruction of the Aravaipa Creek road was first initiated by FEMA on January 24, 1994 (FEMA letter dated January 20). That consultation was withdrawn on March 10, 1994 (FEMA letter dated March 3) to allow for development of additional project information. The present formal consultation began on October 3, 1994, the date your request was received in our office.

The FEMA is the lead Federal agency for this consultation and would provide funding for the project. However, much of the land involved is under the authority of BLM and a right-of-way for the new road and utility alignments would be issued by BLM. Therefore, BLM actions are also under consultation here and BLM is a joint agency in this consultation. The incidental take statement and conservation recommendations apply to both agencies, as appropriate under their differing authorities.

BIOLOGICAL OPINION

It is my biological opinion that implementation of the proposed repair and/or replacement of the Aravaipa Creek road and the issuance of rights-of-way for the new road and utility alignments is not likely to jeopardize the continued existence of spikedace or loach minnow and is not likely to destroy or adversely modify the critical habitat of either of those species.

BACKGROUND INFORMATION

Species Description - Spikedace

Spikedace was listed as a threatened species on July 1, 1986. Critical habitat was designated for spikedace on March 8, 1994 including portions of the upper Gila and Verde Rivers and approximately 15 miles Aravaipa Creek from the N1/2 of the SW1/4 Sec. 26, T.6S., R.17E upstream to the W1/2 of the NE1/4 Sec. 35, T.6S., R.19E. Spikedace is a small silvery fish whose common name alludes to the well-developed spine in the dorsal fin (Minckley, 1973). Spikedace historically occurred throughout the mid-elevations of the Gila River drainage but is currently known only from Aravaipa Creek (Graham and Pinal Counties, Arizona), upper Gila River (Grant and Catron Counties, New Mexico), middle Gila River (Pinal

County, Arizona), Eagle Creek (Greenlee County, Arizona), and Verde River (Yavapai County, Arizona) (Barber and Minckley, 1966; Minckley, 1973; Anderson, 1978; Barrett *et al.*, 1985; Bestgen, 1985; Sublette *et al.*, 1990; Jakle, 1992). Habitat destruction and competition and predation from introduced nonnative fish species are the primary causes of the species decline (Miller, 1961; Williams *et al.*, 1985).

Spikedace lives in flowing water with slow to moderate water velocities over sand, gravel, and cobble substrate (Propst *et al.*, 1986; Rinne and Kroeger, 1988). Specific habitat for this species consists of shear zones where rapid flow borders slower flow, areas of sheet flow at the upper ends of mid-channel sand/gravel bars, and eddies at downstream riffle edges (Propst *et al.*, 1986). Spikedace spawns from March through May with some yearly and geographic variation (Barber *et al.*, 1970; Anderson, 1978; Propst *et al.*, 1986). Actual spawning has not been observed, but spawning behavior indicates the eggs are laid over gravel and cobble where they adhere to the substrate. Spikedace lives about two years with reproduction occurring primarily in one-year old fish (Barber *et al.*, 1970; Anderson, 1978; Propst *et al.*, 1986). It feeds primarily on aquatic and terrestrial insects (Barber and Minckley, 1983; Marsh *et al.*, 1989).

In Aravaipa Creek, spikedace is presently found in suitable habitat throughout the area of perennial flow (Barber and Minckley, 1966; Minckley, 1973; Velasco, 1994). A portion of the proposed project lies along the part of Aravaipa Creek designated as critical habitat.

Recent taxonomic and genetic work on spikedace indicate there are substantial differences in morphology and genetic makeup between remnant spikedace populations. Remnant populations occupy isolated fragments of the Gila basin and are isolated from each other. Anderson and Hendrickson (Anderson and Hendrickson, 1994) found that spikedace from Aravaipa Creek is morphologically distinguishable from spikedace from the Verde River while spikedace from the upper Gila River and Eagle Creek populations have intermediate measurements and partially overlap the Aravaipa and Verde populations. Mitochondrial DNA and allozyme analyses have found similar patterns of geographic variation within the species (Tibbets, 1992).

Species Description - Loach minnow

Loach minnow was listed as a threatened species on October 28, 1986. Critical habitat was designated for loach minnow on March 8, 1994 including portions of the San Francisco, Tularosa, Blue, and upper Gila Rivers, and approximately 15 miles Aravaipa Creek from the N1/2 of the SW1/4 Sec. 26, T.6S., R.17E upstream to the W1/2 of the NE1/4 Sec. 35, T.6S., R.19E. Loach minnow is a small, slender, elongate fish with markedly upwardly-directed eyes (Minckley, 1973). Historic range of loach minnow included the basins of the Verde, Salt, San Pedro, San Francisco, and Gila Rivers (Minckley, 1973; Sublette *et al.*, 1990). Competition and predation by non-native fish and habitat destruction have reduced the range of the species by about 85 percent (Miller, 1961; Williams *et al.*, 1985; Marsh *et al.*, 1989). Loach minnow remains in limited portions of the upper Gila, San Francisco,

Blue, Tularosa, and White Rivers; and Aravaipa, Eagle, Campbell Blue, and Dry Blue Creeks in Arizona and New Mexico (Barber and Minckley, 1966; Silvey and Thompson, 1978; Propst *et al.*, 1985; Propst *et al.*, 1988; Marsh *et al.*, 1990).

Loach minnow is a bottom-dwelling inhabitant of shallow, swift water over gravel, cobble, and rubble substrates (Rinne, 1989; Propst and Bestgen, 1991). Loach minnow use the spaces between, and in the lee of, larger substrate for resting and spawning (Propst *et al.*, 1988; Rinne, 1989). It is rare or absent from habitats where fine sediments fill the interstitial spaces (Propst and Bestgen, 1991). Some studies have indicated that the presence of filamentous algae may be an important component of loach minnow habitat (Barber and Minckley, 1966). The life span of loach minnow is about 2 years (Britt, 1982; Propst and Bestgen, 1991). Loach minnow feeds exclusively on aquatic insects (Schreiber, 1978; Abarca, 1987). Spawning occurs in March through May (Britt, 1982; Propst *et al.*, 1988); however, recent reports have confirmed that under certain circumstances loach minnow also spawn in the autumn (Vives and Minckley, 1990). The eggs of loach minnow are attached to the underside of a rock that forms the roof of a small cavity in the substrate on the downstream side. Limited data indicate that the male loach minnow may guard the nest during incubation (Propst *et al.*, 1988; Vives and Minckley, 1990).

In Aravaipa Creek, loach minnow is presently found in suitable habitat throughout the area of perennial flow (Barber and Minckley, 1966; Minckley, 1973; Velasco, 1994). A portion of the proposed project lies along the part of Aravaipa Creek designated as critical habitat.

Recent biochemical genetic work on loach minnow indicate there are substantial differences in genetic makeup between remnant loach minnow populations. Remnant populations occupy isolated fragments of the Gila basin and are isolated from each other. Based upon her work Tibbets (1992) recommended that the genetically distinctive units of loach minnow should be managed as separate units to preserve the existing genetic variation.

Site Description

Aravaipa Creek is a tributary of the San Pedro River in Pinal and Graham Counties, Arizona (Figure 1). It is a perennial stream of about 10 cubic feet per second (cfs) base flow with a median flow of 16 cfs (Minckley, 1981). Aravaipa Creek is a flashy stream with flood flows occurring during summer and winter storms. The two-year flood event is estimated at 3,790 cfs and the 50-year at 22,100 cfs (FEMA, 1994). The January-February 1993 flooding peaked at an estimated 13,000 cfs (FEMA, 1994).

The Aravaipa Creek watershed is large, encompassing about 537 square miles (USGS, 1993). However, present perennial flow is confined to a segment of about 15 to 20 miles within Aravaipa Canyon, although in the past five years the creek has often flowed all the way to the San Pedro River.

Aravaipa Creek supports a relatively intact native fish community and few nonnative fish, a rare situation in the Gila River basin (Barber and Minckley, 1966; Minckley, 1981; Velasco, 1994). All native fish species are either Federally listed or candidate species, including roundtail chub (Gila robusta), longfin dace (Agosia chrysogaster), speckled dace (Rhinichthys osculus), desert sucker (Catostomus [Pantosteus] clarki), Sonora sucker (Catostomus insignis), spinedace, and loach minnow. Nonnative species recorded from Aravaipa Creek include yellow bullhead (Ameiurus natalis), black bullhead (Ameiurus melas), green sunfish (Lepomis cyanellus), mosquitofish (Gambusia affinis), carp (Cyprinus carpio), and fathead minnow (Pimephales promelas). Red shiner (Cyprinella lutrensis) have been found in Aravaipa Creek, but have not yet become established (Velasco, 1994). Largemouth bass (Micropterus salmoides) are also occasionally found in the creek.

Upland vegetation includes foothills palo verde (Cercidium microphyllum), creosote bush (Larrea tridentata), ocotillo (Fouquieria splendens), saguaro (Cereus giganteus), barrel cacti (Ferocactus spp.), mesquite (Prosopis velutina), and catclaw acacia (Acacia greggii) (Minckley, 1981). Riparian vegetation includes cottonwood (Populus fremontii), willow (Salix spp.), sycamore (Plantanus wrightii), ash (Fraxinus velutina), walnut (Juglans major), seep-willow (Baccharis salicifolia), saltcedar (Tamarix chinensis), water cress (Nasturtium rorippa-aquaticum), and mimulus (Mimulus sp.) (Minckley, 1981; FEMA, 1994).

Aravaipa Creek is a moderate velocity stream with a relatively low gradient (less than 1 percent). The substrate is primarily gravel-cobble with some bedrock in the canyon center and increasing amounts of sand and fine sediment below the canyon. Habitat is predominantly riffles and runs with pools being formed by bedrock, canyon walls, and large woody material. (Barber and Minckley, 1966; Minckley, 1981; Rinne, 1985; Velasco, 1994)

The canyon bottom is narrow and side slopes are steep (30 to 60 degrees) (FEMA, 1994). The road becomes progressively more confined to the riparian in an upstream direction due to the narrowing canyon bottom. Most floodplain terraces have been irrigated and farmed over the past 100 years. In the project area, there are six private parcels with the surrounding land under the jurisdiction of BLM (Figure 2). The largest of the private parcels belongs to The Arizona Nature Conservancy, a private conservation organization, which holds the land as a nature preserve. The remaining five parcels are private residences, although most are second or weekend homes. Agricultural operations are occurring on several of the parcels.

Project Description

The proposed project is to repair and/or replace approximately 1.1 miles of the Aravaipa Creek road in T.6S., R.17.E., Secs. 26, 27, and 34 (Figures 1 and 3). Aravaipa Creek road provides access for landowners along Aravaipa Creek as well as for recreational users of BLM lands, including the Aravaipa Canyon Wilderness. The road was damaged in two areas during flooding in January and February of 1993. The first area (Site 1) is located in

the southeast corner of section 27 (Figure 3). About 250 feet of the road at this site was completely removed by erosion of the roadbed which was located on fill at the base of a rock cliff on the outside curve of a stream meander. The road at this site is particularly vulnerable to flood damage. According to members of the Aravaipa Property Owners' Association, the road washed out at Site 1 in 1967, 1978, 1983, and 1993 (pers. com., January 31, 1993). The second area (Site 2) is located near the center of section 26 (Figure 3). About 900 feet of relatively straight road, located on the outside edge of the riparian vegetation against a steep hillside, was inundated and suffered damage. The purpose of the proposed action is to provide street vehicle access for four private landowners above the washout as well as for the Bureau of Land Management and recreationists using the Aravaipa Canyon Wilderness.

The EA estimates present traffic use of the Aravaipa Canyon road as averaging 10 to 12 vehicles per day, although that varies by season (FEMA, 1994). This figure was calculated from BLM figures showing an average annual visitor use at the west entrance to the Wilderness at approximately 2,500 per year with 3 to 4 people per vehicle. The EA assumed 3.5 people per car and a one-way trip for a total of 714 vehicles per year or 2 vehicles per day. Because the road dead-ends below the Wilderness, this figure should be doubled to account for round trips to a total of 4 vehicles per day. The EA estimates resident and service vehicle use as an additional 8 to 10 vehicles per day. Therefore, the corrected estimate for total vehicles per day is 12 to 14. This use may increase as Arizona population and recreational needs increase. The EA anticipates that the improved access resulting from the proposed action may increase recreational use of the area and may stimulate development on both private and public lands.

The new alignment would be primarily on BLM land, but would cross a private parcel near the downstream end and the upstream end would be located on private land (Figure 2). The road would be 28 feet wide with a 100-foot wide right-of-way held by Pinal County. Terms of a BLM right-of-way agreement for the new alignment have not been defined. However, it is expected that BLM would retain certain discretionary rights to that piece of land and the management of the road.

The preferred alternative of the EA, and the proposed action for this consultation, is to reroute 9,000 feet of the road, placing it further uphill to prevent future washouts and adverse impacts to the aquatic and riparian communities. The new alignment would be an unpaved, all-year roadway which would bypass both Sites 1 and 2. On the downstream end the new alignment would leave the existing road at the Brandenburg campsite (T.6S., R.17E., NW1/4 Sec. 34) rejoining the existing road in the SE1/4 of the NW1/4 Sec. 26 of the same township and range (Figure 3). It would be an approximately level roadbed for most of the route, although the final descent to rejoin the existing road would drop 120 feet in 1,200 feet. The new alignment averages 600 feet further upland from Aravaipa Creek than the old with a range of 300 to 700 feet. There would be extensive cut and fill along the new alignment exposing unstable rock and soil. Short and long-term movement of disturbed materials along the roadbed would be minimized in areas of unstable rock and

soil by installing a brow ditch above the road and covering the slope with chain link fencing. Approximately 12 intermittent washes would be crossed by installation of concrete pipe culverts. Gabions would be installed at each culvert crossing to prevent erosion and sedimentation.

Some fill would be obtained from material generated by cuts along the new alignment. No excess material is expected. If material unsuited for fill is generated, it would be transported, along with any other debris, to the Pinal County Landfill near Dudleyville for disposal. An additional 19,000 cubic yards of fill would be needed. This fill would be obtained from the Clark Pit Landfill in Mammoth. The Clark Pit Landfill is a licensed operation with all necessary state and Federal permits. The fill would be hauled 19 miles to the site, and would require approximately 1,900 round trips on the Aravaipa Canyon road. Haul trucks and construction equipment would not use the existing Aravaipa Canyon road in the damaged sections. No trucks or equipment will use the low-water crossing of Aravaipa Creek at Site 1.

Storing of fill and other materials, machinery storage, and other staging activities would occur in an approximately 1.5 acre existing cleared and graded parking area adjacent to the Brandenburg campsite. A second potential staging area would be located in a previously cultivated field on the private parcel at the upstream end of Site 2. A trailer may also be placed at this staging area as living quarters for one person during construction.

Water for dust control during construction would be trucked to the project site from the Central Arizona College near the intersection of Aravaipa Creek road and Highway 77. There is an established well and storage tank there that can supply all water needs of the proposed project.

It is not yet known whether the old alignment and right-of-way between Brandenburg campsite and Site 1 will be abandoned or maintained by the County. A decision on that will be made later by the Pinal County Board of Supervisors. Because that portion of the existing road would provide access to two pieces of private land, it would not be closed and would be maintained by the private landowners if the County abandoned the right-of-way. The temporary low-water crossing at Site 1 would be abandoned and would not be maintained by the County. The old alignment beyond the Brandenburg campsite would be signed for use by residents only and a barricade would be placed across the alignment at Site 1 to prevent public use of the low-water crossing. However, because the low-water crossing is on private land, some private use may occur. The emergency section 7 consultation and nationwide section 404 permit from the Corps would no longer apply and any future maintenance of the low-water crossing by the private landowners may be subject to compliance with section 9 of the ESA and section 404 of the Clean Water Act.

Use and maintenance of the two portions of the existing road on private land above Site 1 would be at the discretion of the two private landowners involved. A new driveway would be constructed connecting the new alignment to the residence on the private parcel just

upstream from Site 1 and the second parcel would be directly accessed by the new alignment. No portion of the old alignment would be required to access residences from the new alignment. The two small portions of the old alignment and right-of-way on BLM lands would revert to BLM and would be allowed to revert to a natural state. It has not yet been decided if BLM would close those two sections to vehicle use.

Several mitigation actions are planned. Approximately 85 saguaro are expected to be removed and may be transplanted to surrounding areas outside of, but nearby, the roadway. The Arizona Department of Agriculture will make site-specific recommendations for these and other cacti salvage and transplants before construction begins. Off-road vehicle use will be minimized during the transplants. To reduce sediment into the creek, catch basins, fine screens, and silt fencing would be used downhill from the construction area to catch sediment-transporting runoff from the disturbed soils. Runoff may originate as precipitation or may result from water being used to lessen dust or for other construction purposes. A biologist would be on-site during construction to assure protection of desert tortoises (Gopherus agassizii). Construction timing would be coordinated with Arizona Game and Fish Department to reduce impacts to desert bighorn sheep (Ovis canadensis) and nesting raptors.

Utility lines servicing local residences presently run in a 16-foot wide County easement or right-of-way along the existing road alignment. These lines are owned and operated by the San Carlos Irrigation Project (SCIP) of the Bureau of Indian Affairs. The SCIP plans to relocate 30 poles and the accompanying lines from the existing location to the new alignment, once road construction is completed. A new 50-foot right-of-way would be required adjacent to the road right-of-way and the old right-of-way would be abandoned and revert to private land owners and BLM.

EFFECTS OF THE ACTION

Environmental Baseline

The environmental baseline includes past and present impacts of all Federal, State, or private actions in the action area, the anticipated impacts of all proposed Federal actions in the action area that have undergone formal or early section 7 consultation, and the impact of State and private actions which are contemporaneous with the consultation process. The environmental baseline defines the current status of the species and its habitat to provide a platform to assess the effects of the action now under consultation.

The status of spikedace and loach minnow is declining. Although both species are currently listed as threatened, the Service has found they warrant uplisting to endangered status. Reclassification proposals are pending, however work on them is precluded due to work on other higher priority listing actions (USFWS, 1994). The need for reclassification is not due

to data on declines in the species themselves, but is based upon increases in serious threats to a large portion of their habitats.

In Aravaipa Creek there are a number of threats to spikedace and loach minnow and their habitat. Aravaipa Creek and its watershed have been subjected to substantial human uses since the settlement of the area by Europeans. The watershed, like many in the desert southwest, has been altered by grazing, mining, timber harvest, water development, irrigated agriculture, roads, recreation, and other human uses (Minckley, 1981; Bahre, 1991). These uses have altered runoff, sediment transport, and groundwater recharge patterns within the basin and may have caused changes in the perennial flow of Aravaipa Creek. Minckley (1981) reports that comparisons of recent and 80 to 120 year-old accounts and photographs reveals that the dry incised stream channel near Klondyke was historically a marshy area of perennial water. He also reports that riparian forests were more massive in size and development with a larger component of younger trees and that common reed (Phragmites australis), first noted by Bell in 1869 (as cited in Minckley, 1981), has been eliminated from Aravaipa Creek.

Aravaipa Creek has not been perennial to the confluence with the San Pedro River within historic times (Hutton, 1895 as cited in Davis, 1986). However, the average perennial length and duration has decreased, within a range of substantial yearly variation. Hutton recorded extensive cottonwood, sycamore, and ash along the lower five miles of the stream that he believed to be intermittent. That riparian forest is mostly gone indicating a likely decrease in duration or amount of surface or subsurface flow. With the loss of the cienega below Klondyke, the perennial length of Aravaipa Creek decreased, a trend which continued with the introduction of groundwater pumping into the Aravaipa watershed. Adar (1985) estimates the usual beginning of perennial flow to be about two miles downstream from its 1900 location.

Human uses along Aravaipa Creek have resulted in alterations to the stream channel. Diversion dams have been and continue to be constructed in several places to channel water into irrigation ditches. These generally consist of using heavy equipment to push up an earth and rock berm which impounds small areas but washes out in high water. Channelization has taken place along many segments of the stream. Rip rap, earthen dikes and other forms of channel control have been constructed. Although none of these is a major channel modification, their effects are cumulative. Constraining a stream channel may cause upstream and downstream channel modifications and erosion and failure of such structures often causes radiating erosion (Rosgen, 1994). Minckley (1981) notes that in photographs from prior to 1900, streambanks along the east end of the perennial flow were less incised than at present.

In the late 1800's and early 1900's mining was occurring at various locations in the Aravaipa watershed. A lead mill was built at Klondyke in 1925 and the tailings from that mill are located on the bank of Aravaipa Creek. Recent changes in the stream channel are eroding

the tailings into the creek. Surface and groundwater violations of water quality have been documented in the area of the tailings (Hyde, 1993).

Although Aravaipa Creek presently supports fewer nonnative species than many of Arizona's streams, the number and distribution of the nonnative species is increasing. In 1981, four nonnative fishes were known from the watershed and only two of those were recorded from Aravaipa Creek itself (Minckley, 1981). By 1992, eight nonnative fishes were known from Aravaipa Creek and at least four of those were thought to be reproducing in the creek (Velasco, 1994). The remaining four were thought to originate from movement out of ponds, stocktanks, and the San Pedro River. Green sunfish, largemouth bass, and yellow and black bullhead are all predatory species which consume spiketail and loach minnow. Red shiner is thought to be highly detrimental to small native cyprinids, such as spiketail and loach minnow through competition and/or predation (Bestgen, 1986; Marsh *et al.*, 1989; Rinne, 1991). Although red shiner invaded the entire perennial length of Aravaipa Creek in 1990-91, they did not establish a population and have only been found once since, in lower Aravaipa Creek in October 1993 (Bettaso, 1993).

There have been four previous formal section 7 consultations concerning Aravaipa Creek. All concerned effects to spiketail and loach minnow. In 1990, the BLM Safford District Resource Management Plan was found to not jeopardize the continued existence of the spiketail and loach minnow nor to adversely modify their proposed (at that time) critical habitat. Adverse effects from that plan accrued from continuation of livestock grazing and livestock waters in the watershed. In 1993, an emergency consultation resulted in a nonjeopardy finding for spiketail and loach minnow from placement of 800 feet of rip rap to protect an existing residence from flood damage. In 1994, a biological opinion was issued on a second emergency consultation which occurring in 1993. This consultation also resulted in a nonjeopardy finding for both species from placement of 525 feet of rip rap to protect a residence from flood damage. Adverse effects to the two fishes from the rip rap projects were primarily the cumulative impacts of stream channelization. In 1994, a biological opinion was issued finding jeopardy and adverse modification of critical habitat for both spiketail and loach minnow from the potential for the Bureau of Reclamation's Central Arizona Project to introduce and spread nonnative aquatic species. The reasonable and prudent alternative for removal of jeopardy included the construction on Aravaipa Creek of a paired set of barriers to upstream fish movement. This action is expected to substantially reduce future adverse impacts to spiketail and loach minnow through predation and competition by nonnatives. However, disruption of localized spiketail and loach minnow habitat is expected from construction and operation of the barriers.

Direct and Indirect Effects of the Proposed Action

The proposed Aravaipa road repair and rerouting is expected have long-term net beneficial effects to the survival and recovery of spiketail and loach minnow and their habitats.

Adverse effects of roads and road crossings on streams has been documented for many types of streams and fish species (Dobyns, 1981; Meehan, 1991; Megahan *et al.*, 1992; Young, 1994). Spikedace and loach minnow are susceptible to mortality when heavy equipment is used in the stream channel or at low-water crossings. Because they are fixed to rocks in shallow riffle areas, loach minnow eggs are also susceptible to crushing if equipment or vehicle use occurs in the stream during spring or fall spawning seasons. No data exists on spikedace egg incubation sites, but it is likely its eggs are also subject to crushing when present in the spring. Both species may be adversely affected by increased sediment deposition on the streambottom. Adverse effects of stream sedimentation to fish and fish habitat have been extensively documented (Murphy *et al.*, 1981; Wood *et al.*, 1990; Newcombe and MacDonald, 1991; Barrett, 1992; Megahan *et al.*, 1992). Because of their benthic habit, loach minnow and their eggs are particularly vulnerable to substrate sedimentation. Roads adjacent to or crossing streams may result in changes in riparian vegetation and stream channel morphology that may alter quality and availability of habitat for spikedace and loach minnow.

The existing Aravaipa Creek road alignment has adverse impacts to Aravaipa Creek and its aquatic and riparian communities including spikedace and loach minnow. The repeated repairs to the road at Site 1 have resulted in reoccurring use of machinery in the stream channel and have fed sediments into the stream. Diversion of the stream likely occurred during major repairs to allow machinery to work more easily. All of these actions likely resulted in mortalities of spikedace and loach minnow and in adverse modification to their habitat in the area and for some distance downstream. Changes in the angle of the meander at this site due to fill placement or washout may have contributed to upstream and/or downstream channel changes, such as the one which resulted in erosion of the high floodplain terrace at the Jep White residence during the 1993 flooding.

The periodic washout of Site 1 has also resulted in reoccurring need for a low-water crossing at that site. Low water crossings adversely impact spikedace and loach minnow through direct mortality, sediment generation, loss of riparian vegetation, channel changes, and increased probability of serious streambank or channel erosion.

The roadbed at Site 2 is located between the riparian vegetation and the steep hillside in what was originally part of the riparian zone. Although the road is elevated by fill, it is low enough that it is inundated by floods at frequent return intervals. Erosion of exposed sediment from the road into the creek occurs during rain events and flooding. Dust from the road has a negative impact on both the riparian vegetation and the stream.

Relocation of the road uphill from the creek and riparian zone would remove the adverse impacts that presently result from the location of the existing road, the frequent washout and repair, and the temporary low-water crossing. Rerouting of the road uphill will require extensive excavation and fill. Erosion and sediment from exposing and destabilizing soils and rock on the slopes above the creek will likely result in some sediment input to Aravaipa Creek. The extent of that input is unknown but may equal or exceed that from the existing road alignment.

During construction, a number of potentially toxic substances, such as petroleum products, will be in use. The potential exists for these substances to find their way into Aravaipa Creek resulting in death of spinedace or loach minnow and/or reduction of their food base. The proposed project includes a number of measures to minimize this potential, such as placement of the staging area away from the floodplain and use of sediment catchment devices downhill from construction.

Portions of the old alignment will continue to be used by private landowners and possibly limited public use. Continued use of the section of old alignment from the Brandenburg campsite to the washout at Site 1 should not affect either spinedace or loach minnow, particularly if it is limited to private access. That portion of the road is sufficiently removed from the creek that sediment input and effects to the stream channel and riparian vegetation are minimal. Occasional private use of the low-water crossing at Site 1 may have some effect on spinedace and loach minnow, the extent would depend upon frequency of use and whether stream substrate and banks are altered. Providing a closure to public use of the low-water crossing is maintained, the effects from landowner use would not be attributable to the proposed project.

Continued use by the public of the old alignment upstream from Site 1 could negate many of the beneficial effects of the new road alignment. Presumably any public vehicular traffic in that area would be of a lesser extent than on the main road. However, as a side road accessing the stream, the potential would exist for increasing camping and recreational use of the streambank along the BLM lands. This could lead to localized increases in riparian vegetation loss and breakdown of streambanks. If the BLM portions of the old alignment above Site 2 are closed to vehicular traffic, impacts from private use of the old road alignment would be minimal. Because BLM has not yet decided whether the BLM segments of the old alignment upstream from Site 1 will be open or closed to vehicular traffic, we have assumed for the purposes of this consultation that these segments will be closed. If a later decision is made to maintain the old alignment open to vehicular use, additional section 7 consultation may be required.

The new and improved road alignment could encourage increased public use of the Aravaipa Creek area and/or increased development of private lands. However, the proposed project is only a short portion of the overall road and may not be a significant factor in influencing the overall growth of use in the area. Increased recreational use could adversely impact spinedace and loach minnow through streambank and watershed degradation and pollution. Changes in residential, agricultural, or commercial development in the area could have substantial adverse effects on spinedace and loach minnow, but those effects and their level would be highly dependent on the type and extent of changes.

Cumulative Effects of the Proposed Action

Cumulative effects are those effects of future non-Federal (State, local government, or private) activities on endangered or threatened species or critical habitat that are reasonably certain to occur during the course of the Federal activity subject to consultation. Future Federal actions are subject to the consultation requirements established in Section 7 and, therefore, are not considered cumulative in the proposed action.

Cumulative effects on the fish in Aravaipa Creek come from a variety of sources. Many of those are the ongoing activities in the watershed, such as livestock grazing and watering, irrigated agriculture, groundwater pumping, stream diversion, bank stabilization, channelization, and recreation. Some of these activities, such as irrigated agriculture are declining and are not expected to contribute substantially to cumulative long-term adverse impacts on spikedace and loach minnow.

Other activities, such as recreation, are increasing. Members of the Aravaipa Property Owners' Association report increasing amounts of non-wilderness recreation use along Aravaipa Creek (pers. com., January 31, 1993). The BLM is proposing expanded recreation facilities on Aravaipa Creek. Because most of the stream bottom below the wilderness is privately owned, a potential exists for increase in residential or commercial use of the area. Increasing recreational, residential, or commercial use of the private lands along the creek would likely result in increased cumulative adverse effects to spikedace and loach minnow through increased water use, increased pollution, and increased alteration of the streambanks through riparian vegetation suppression, bank trampling, and erosion. An increase in human structures in the area would likely lead to more bank stabilization and channelization, changing the availability and quantity of suitable spikedace and loach minnow habitat.

INCIDENTAL TAKE

Section 9 of the Act, as amended, prohibits any taking (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct) of listed species of fish and wildlife without a special exemption. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. Under the terms of Section 7(b)(4) and Section 7(o)(2), taking that is incidental to, and not intended as part of, the agency action is not considered a prohibited taking provided that such taking is in compliance with the incidental take statement.

The FWS does not anticipate that the proposed repair and/or replacement of Aravaipa Creek road and the issuance of BLM rights-of-way for the new road and utility alignments would result in any incidental take of spikedace or loach minnow. Accordingly, no incidental take is authorized. Should any take occur, FEMA and/or BLM must reinitiate

formal consultation with the Service and provide a description of the circumstances surrounding the take. Operations must be stopped in the interim period between the initiation and completion of the new consultation if it is determined that the impact of the additional taking will cause an irreversible and adverse impact on the species, as required by 50 CFR 402.14(i).

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. The term conservation recommendations has been defined as Service suggestions regarding **discretionary agency activities** to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information. The recommendations provided here relate only to the proposed action and do not necessarily represent complete fulfillment of the agency's 7(a)(1) responsibility for these species.

The Service recommends that interpretive signs be placed in the area of the road reconstruction to inform the public of the resource protection efforts incorporated into the road repair project. These signs should address the need for the road rerouting and the benefits to the spinedace and loach minnow along with the rest of the riparian and native fish communities of Aravaipa Creek. The Service would appreciate the opportunity to review the draft content for the signs prior to their completion and posting.

In order for the FWS to be kept informed of actions that either minimize or avoid adverse effects or that benefit listed species or their habitats, the FWS requests notification of the implementation of any conservation recommendations.


CONCLUSION

This concludes formal consultation on the proposed repair, rerouting, and right-of-way issuance for the Aravaipa Creek road. As required by 50 CFR 402.16, reinitiation of formal consultation is required if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may impact listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action.

If we can be of further assistance, please contact Sally Stefferud or Ted Cordery.

Sincerely,



 Sam F. Spiller
State Supervisor

cc: Director, Arizona Game and Fish Department
Regional Director, Fish and Wildlife Service, Albuquerque, NM (AES)
Director, Fish and Wildlife Service, Washington, D.C. (DES)
District Manager, Bureau of Land Management, Safford, AZ
Area Director, Bureau of Indian Affairs, Phoenix, AZ
State Director, Arizona Nature Conservancy, Tucson, AZ
President, Aravaipa Property Owners' Association, Winkelman, AZ

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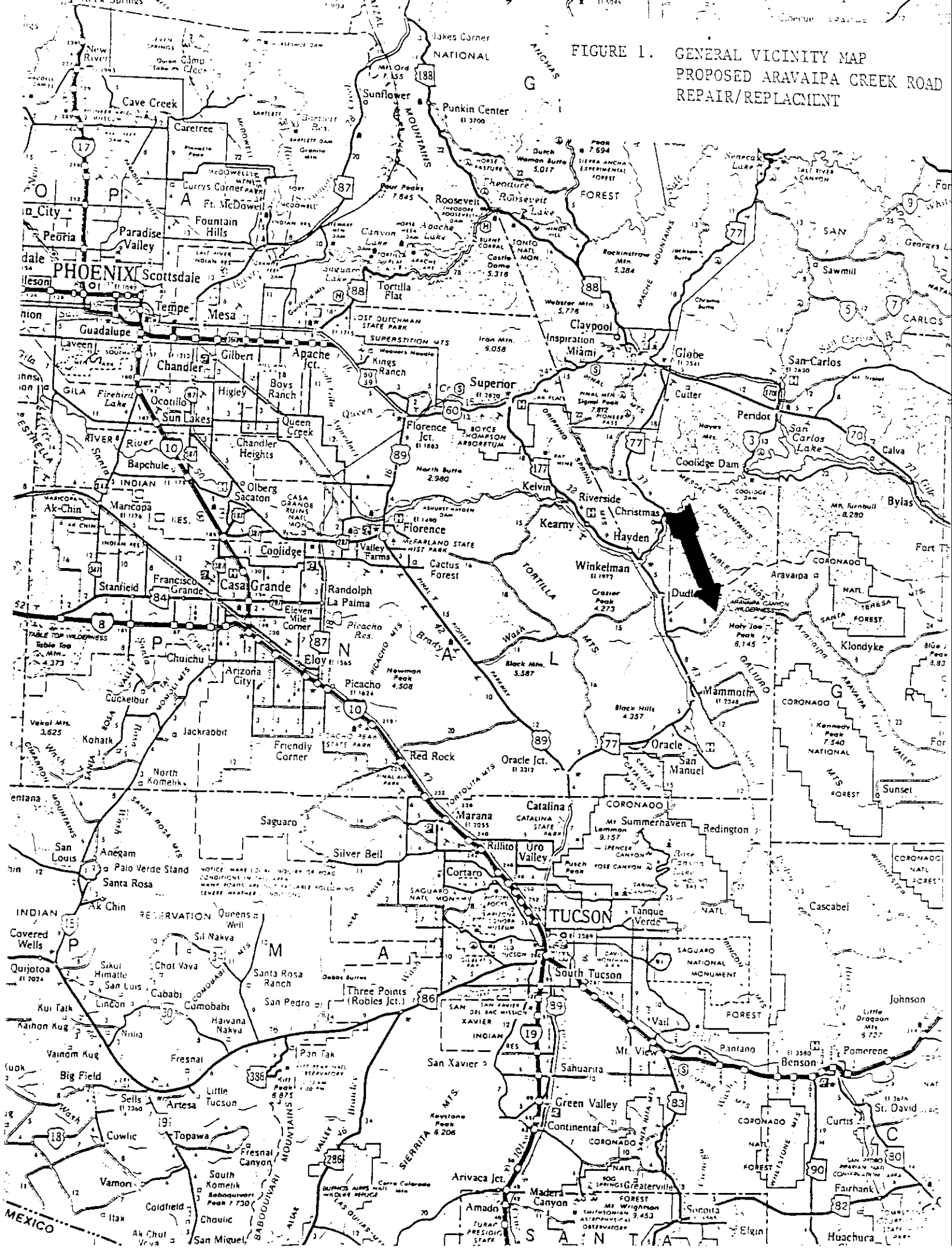
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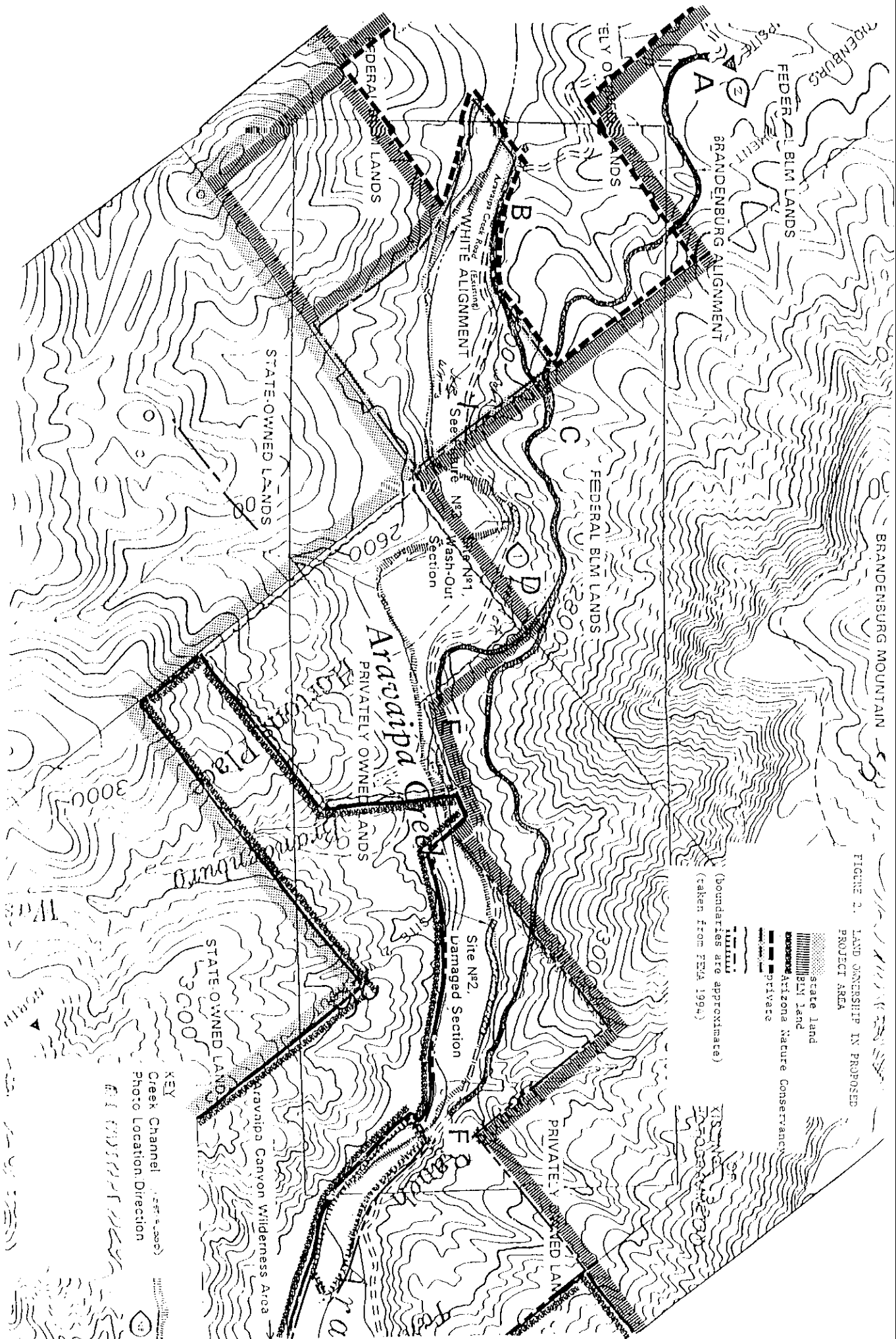
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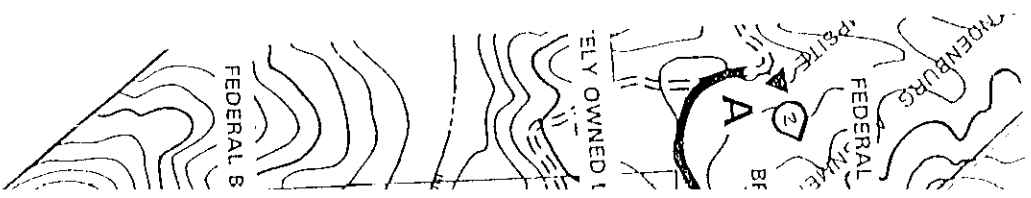
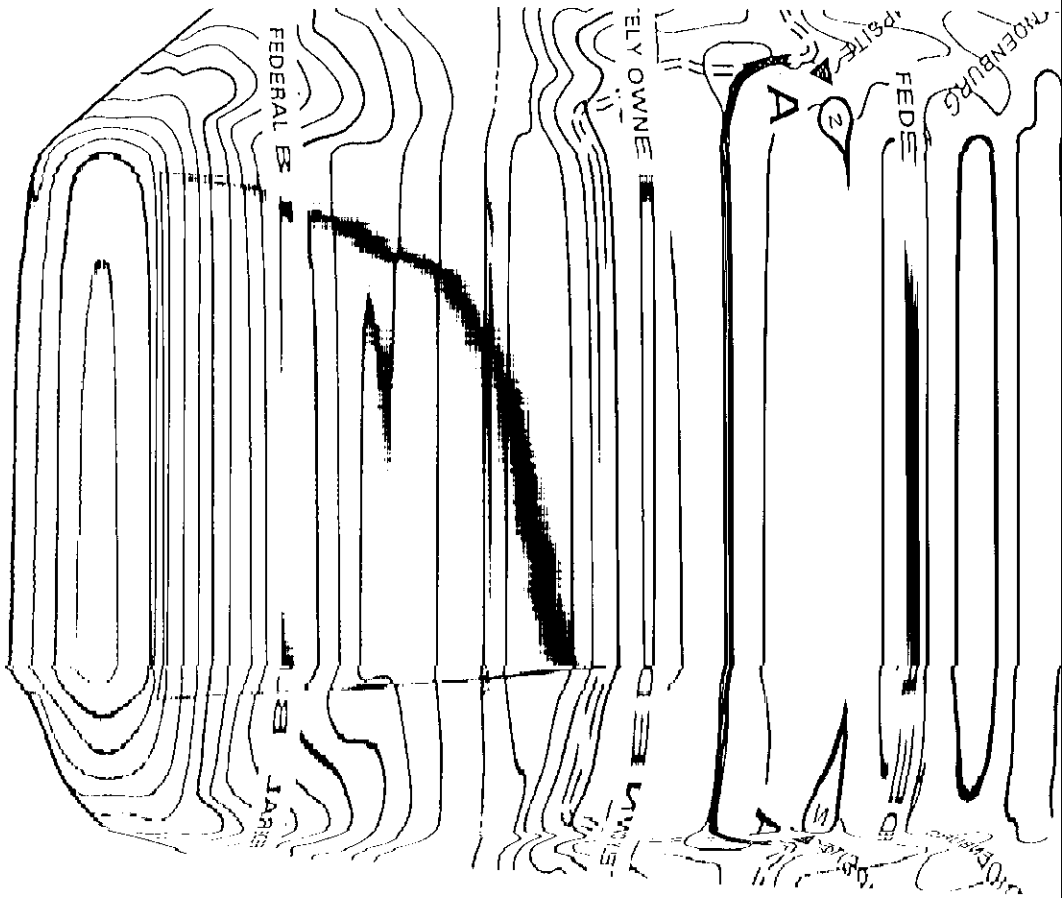
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FIGURE 1. GENERAL VICINITY MAP
PROPOSED ARAVAIPA CREEK ROAD
REPAIR/REPLACEMENT







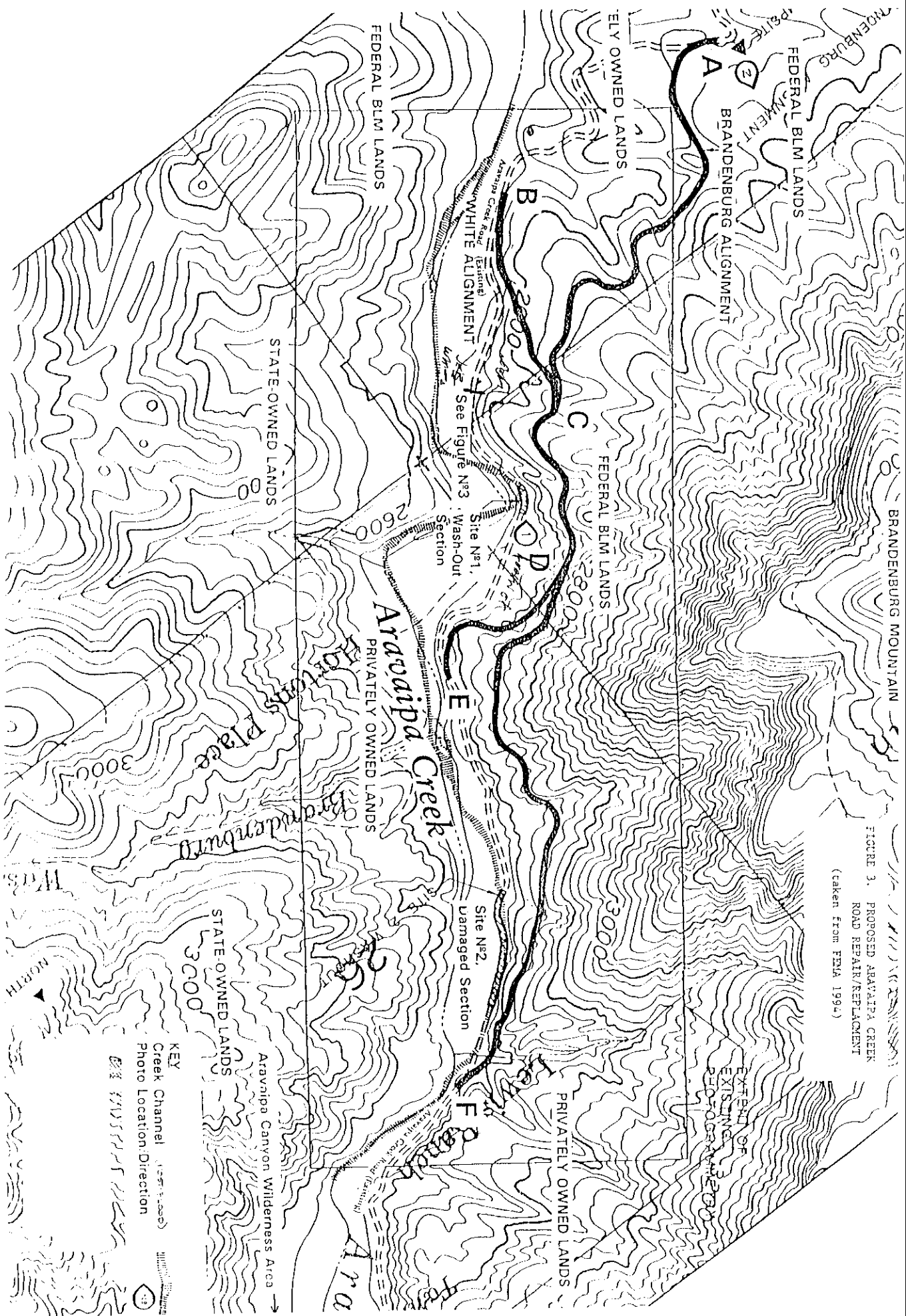


FIGURE 3. PROPOSED ARAVAIPA CREEK
ROAD REPAIR/REPLACEMENT
(taken from FDOT 1994)